RIGOL

Selection Guide

M300 Series
Data Acquisition/Switch System

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Document Overview

This manual guides users to configure M300 series data acquisition/switch system so as to build the measurement system according to their requirements. You can get a full understanding of the using information of M300 series data acquisition/switch system via this manual together with the quick guide and data sheet.

For the detailed specifications, please refer to *M300 Data Sheet*. For the product overview, please refer to *M300 Quick Guide*.

M300 Overview

M300 series data acquisition/switch system provides 5 slots and supports 8 kinds of plug-in modules including DMM Module, Multiplexer, Matrix Switch and Multifunction Module. With its modular structure, it combines precision measurement capability with flexible signal connections and can provide versatile solutions for the applications that require multiple points or multiple signals to be tested. This can be especially useful in product performance test during the R&D phase and automatic test during the production process.

M300 provides a 4.3 inch high-resolution color LCD, user-friendly interface design, easy-to-use keyboard layout as well as clear key backlight and operation prompts. M300 is extremely flexible and easy to use. For remote control versatility, it comes with RS232, USB, LAN and GPIB interfaces.

Main Features:

- Up to 320 switch channels per main frame (with very low cost per channel)
- Can run independently without PC
- Direct storage of data to USB storage device
- Can store up to 100k time-stamped readings
- 8 modules supported
- The 6½ digit DMM provided can be inserted into any slot. It supports DCV, DCI, ACV, ACI, 2WR, 4WR, PERIOD, FREQ, TEMP (Thermocouple, Thermistor and RTD) and any sensor measurement functions.
- Multiple standard communication interfaces, including USB Device, USB Host, GPIB, LAN (LXI Core 2011 Device) and RS232
- Standard SCPI command set
- Math statistic function: AVG, MAX, MIN and SDEV
- User-friendly interface
- On-line help system
- Multiple system languages
- 4.3 inch color LCD
- PC control and analysis software (Ultra Acquire)

M300 Options and Accessories

M300 series data acquisition/switch system provides the following options and accessories. To order the desired options or accessories, please contact **RIGOL** or the local distributor. For the using method and technical specifications of the M300 main frame, please refer to *M300 User's Guide*. This manual provides detailed introductions of the using method of the options and accessories of M300 and guides users to select the desired optional accessories.

Table 1 M300 Options and Accessories List

	Description	Ordering No.
Main Frame	M300 Data Acquisition/Switch System	M300
	M300 Data Acquisition/Switch System + DMM Module	M301
	M300 Data Acquisition/Switch System + DMM Module + MC3120 20-Channel Multiplexer	M302
Standard Accessories	Power Cord Conforming to the Standard of the Country	--
	USB Cable	CB-USBA-USBB-FF-150
	Mixed-interface Separator Line	MIX-SEPARATOR
	Four Spare Fuses: Two AC, 250 V, T250 mA fuses Two AC, 250 V, T3.15 A fuses	--
	Quick Guide	--
	Resource CD (User's Guide and Ultra Acquire)	--
Optional Accessories: Module	DMM Module (6½ digits)	MC3065
	20-channel Multiplexer	MC3120
	32-channel Multiplexer	MC3132
	64-channel Single-ended Multiplexer	MC3164
	20-voltage-channel + 4-current-channel Mixed Multiplexer	MC3324
	16-channel Actuator	MC3416
	Multifunction Module	MC3534
	4×8 Matrix Switch	MC3648
Optional Accessories: Terminal Block	MC3120 Terminal Block	M3TB20
	MC3132 Terminal Block	M3TB32
	MC3164 Terminal Block	M3TB64
	MC3324 Terminal Block	M3TB24
	MC3648 Terminal Block	M3TB48
	MC3534 Terminal Block	M3TB34
	MC3416 Terminal Block	M3TB16
Optional Accessories	RS232 Serial Cable	-
	GPIB Invert Port	M3GPIB
	Analog Bus External Port	A-BUS-EXT-PORT
	Rack Mount Kit[1]	RM-1-M300
	Rack Mount Kit for Two Instruments[1]	RM-2-M300
	PC Application Software for M300 Series[1]	Ultra Acquire

Note[1]: For the detailed information, please refer to the corresponding manuals (download them from **RIGOL** website (www.rigol.com)).

M300 Standard Accessories

Power Cord

USB Cable

Mixed-interface Separator Line

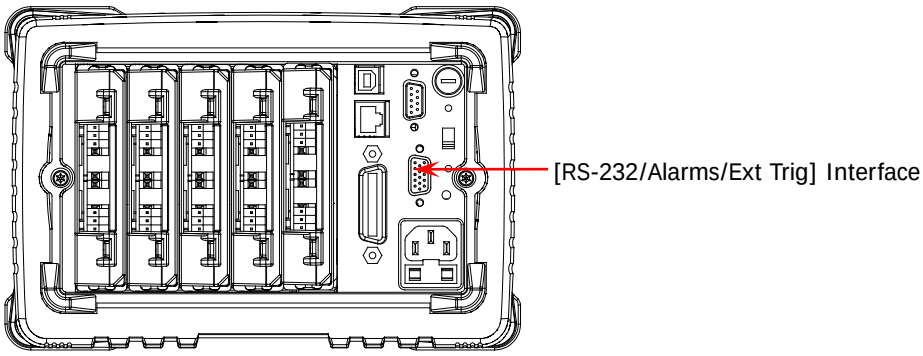
Fuse

Quick Guide

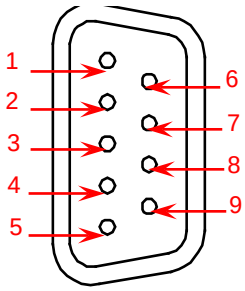
Resource CD

Mixed-interface Separator Line

The mixed-interface separator line is used to convert the **[RS-232/Alarms/Ext Trig]** interface (25-pin male) at the rear panel to two 9-pin interfaces. Wherein, one is a 9-pin male interface used as a standard RS232 interface and the other is a 9-pin female interface used for alarm output and external trigger signal input.



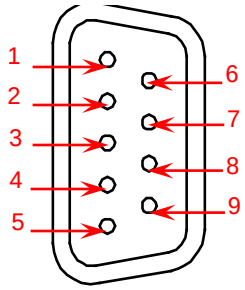
RS232: connect this interface with the PC via a RS232 serial cable (optional accessory) to build the communication between M300 and the PC. You can program and control the instrument via the PC.



RS232 Interface

Pin	Name	Definition
1	--	--
2	RXD	Received Data
3	TXD	Transmitted Data
4	DTR	Data Terminal Ready
5	SGND	Signal Ground
6	DSR	Data Set Ready
7	RTS	Request To Send
8	CTS	Clear To Send
9	--	--

Alarms/Ext Trig: as shown in the figure below, pin 1 to pin 4 are used to output TTL pulse when an alarm is generated in the corresponding alarm channel. Pin 6 is used to receive the external trigger signal. When an external digital multimeter is connected for measurement, pin 5 and pin 6 are used together to control the measurement.



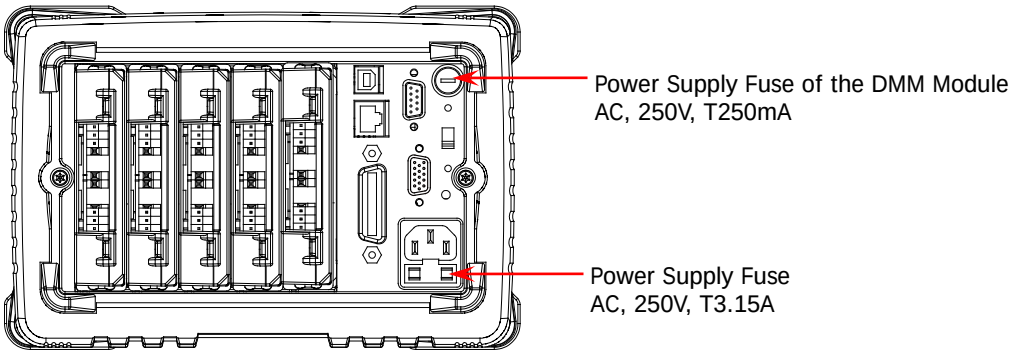
Alarms/Ext Trig Interface

Pin	Definition
1	Alarm 1 Output
2	Alarm 2 Output
3	Alarm 3 Output
4	Alarm 4 Output
5	Channel Closed Output
6	Ext Trig Input/Channel Advance Input
7	GND
8	Not Used
9	Not Used

Fuse

The AC, 250V, T250mA fuse is the alternate power supply fuse for the DMM module; the AC, 250V, T3.15A fuse is the alternate power supply fuse, as shown in the figure below.

The AC power supply connected via the power socket is divided into two paths with one path providing power for the DMM module and the other path providing power for the other circuits. M300 provides the power supply fuse and independent power supply fuse of the DMM module.



To replace the fuses, follow the methods below.

- **Replace the power supply fuse of the DMM module**
  1) Turn off the instrument and remove the power cord.
  2) Press down the fuse cap using a straight screwdriver and rotate the screwdriver clockwise.
  3) Select the correct voltage scale at the voltage selector.
  4) Remove the fuse cap and fuse.
  5) Replace the old fuse with a specified fuse and reinstall the fuse cap.

CAUTION
To avoid electric shock or fire, please use the specified fuse.

- **Replace the power supply fuse**
  1) Turn off the instrument and remove the power cord.
  2) Insert a small straight screwdriver into the slot at the power socket and pry out the fuse seat.
  3) Replace the old fuse with a specified fuse.
  4) Reinstall the fuse seat into the slot.

CAUTION
To avoid electric shock or fire, please use the specified fuse and make sure that the fuse seat is not short-circuited.

M300 Optional Accessories

Modules and Terminal Blocks

Module Appearance Diagrams

M300 provides 8 kinds of modules, including the DMM module, 20-channel multiplexer, 32-channel multiplexer, 64-channel single-ended multiplexer, multi-function module and etc. The appearance diagrams of the modules are as shown in the figures below.

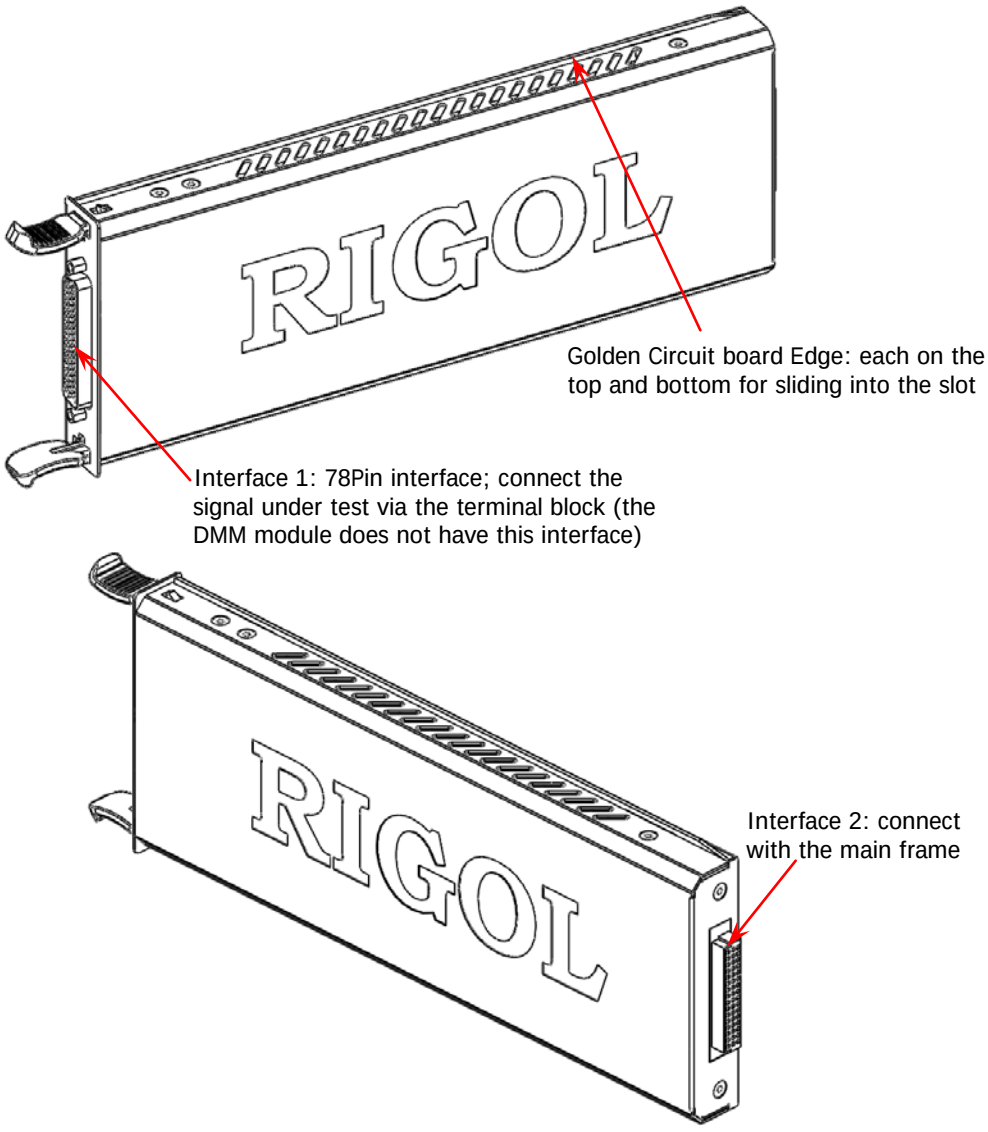


Figure 1 Module Appearance Diagrams

To Connect the Module and Terminal Block

Multiple signals to be measured can be connected to the plug-in modules through the external terminal blocks and then switched to the DMM module or external DMM.

WARNING
Cut off all the power supplies before opening the terminal block or removing the terminal block from the module.

1. Place the terminal block with the front side (with the **RIGOL** caption) facing downward; pull the two latches in the arrow direction in the figure below and press them down. Place the terminal block with the front side facing upward; pull the upper cover of the terminal block upward and remove it.

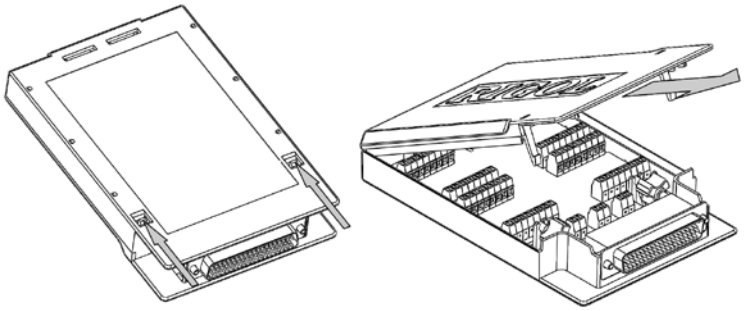


Figure 2 Disassemble the Upper Cover of the Terminal Block

2. Connect the cables for connecting the signal under test according to the labels on the circuit board of the terminal block. Pass the binding wires through the two groups of holes as pointed out by the arrows in the figure below to fix the cables connected. Pay attention to the channel or terminal connected to the cable to ensure that the signal connected is correct.

   Note: For the layout and connection methods of the terminals of each terminal block as well as the specification requirements of the connecting cables, refer to the introductions in the later sections.

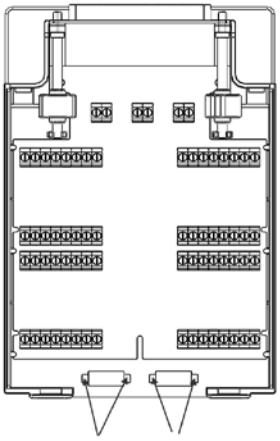


Figure 3 Internal Structure Diagram of the Terminal Block

3. Connect the terminal block to the module via interface 1 (namely the 78Pin interface; for the interface definition, refer to Figure 1) on the module and screw down the two screw rods onto the nuts on the module.

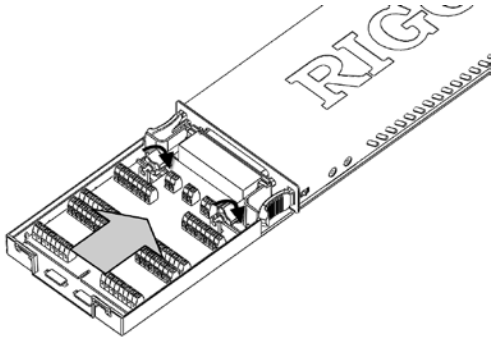


Figure 4 Connect the Terminal Block and Module

4. Close the upper cover of the terminal block.

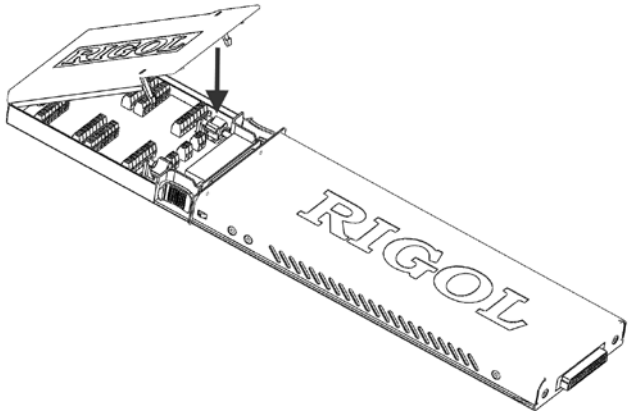


Figure 5 Close the Upper Cover of the Terminal Block

5. Insert the module connected with the terminal block into the slot of the mainframe. As shown in Figure 1, there is a golden circuit board edge both on the top and bottom of the module. Aim the two edges with the sliding chutes in the main frame slot and push the module in until you hear a sound. At this point, interface 2 (for the interface definition, refer to Figure 1) is connected to the main frame.

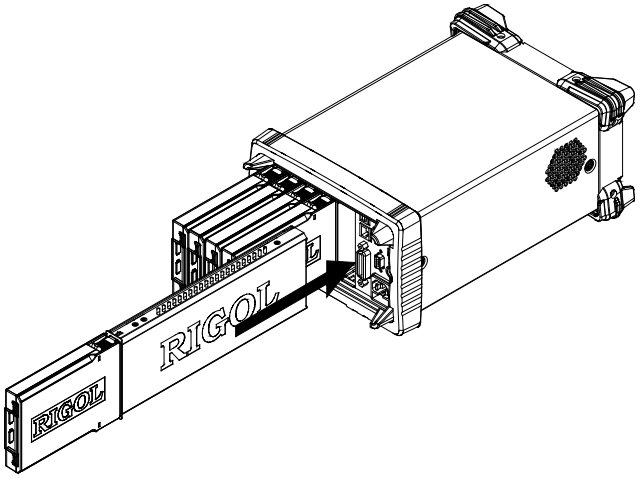


Figure 6 Insert the Module Connected with the Terminal Block into the Main Frame Slot

Note:
All the modules of M300 do not support hot-plugging. Therefore, please turn the main frame off before inserting the modules into the main frame.

Connecting Cable Specification Requirements

To reduce the error caused by the connecting cables, 16AWG to 28AWG conducting wires with 5mm to 6mm stripping length are required. You are recommended to use 20AWG conducting wire with 5.5mm stripping length. The diameter, area and copper impedance of each kind of conducting wire are as shown in the table below.

Note: The "Copper Impedance" in the table below refers to the DC impedance of the single-direction copper wire under 25℃. The temperature coefficient of the copper wire is 0.35%/℃. When a pair of copper wires is used, the impedance value doubles.

Table 2 Recommended Cable Specifications

AWG	Diameter (mm)	Area (mm^2)	Copper Impedance (Ω/km)
16	1.291	1.31	13.17
17	1.15	1.04	16.61
18	1.024	0.823	20.95
19	0.912	0.653	26.42
20	0.812	0.518	33.31
21	0.723	0.41	42
22	0.644	0.326	52.96
23	0.573	0.258	66.79
24	0.511	0.205	84.22
25	0.455	0.162	106.2
26	0.405	0.129	133.9
27	0.361	0.102	168.9
28	0.321	0.081	212.9

DMM Module

The DMM module (MC3065) is used to measure the signals under test and has 6½ digit reading resolution. The measurement functions include DCV, ACV, DCI, ACI, 2-wire resistance, 4-wire resistance, frequency, period, temperature and any sensor. After connecting the DMM module, make sure that the signal under test connected to the analog bus is no greater than 300Vdc or 300Vrms.

The DMM module is as shown in the figure below. The DMM module does not have interface 1 (namely the 78Pin interface; for the interface definition, refer to Figure 1).

Figure 7 MC3065

Multiplexer and Terminal Block

M300 provides 4 kinds of multiplexer modules as well as 4 kinds of external terminal blocks for the multiplexer modules to connect the signals under test in 1-wire, 2-wire and 4-wire connection modes.

Table 3 Multiplexers and the Corresponding Terminal Blocks and Connection Modes

Module	Terminal Block	Supported Connection Mode
MC3120	M3TB20	2-wire and 4-wire
MC3132	M3TB32	
MC3164	M3TB64	1-wire
MC3324	M3TB24	2-wire and 4-wire

1. MC3120 and M3TB20

MC3120 is a 20-channel multiplexer. All the 20 channels switch both HI and LO inputs, thus providing fully isolated signals for the DMM module. MC3120 is divided into two banks (called A and B) with 10 two-wire channels for each bank. When making 4-wire resistance measurement, the instrument automatically pairs the channels of A bank and B bank. All the channels added into the scan list are break-before-make. You can close multiple channels on this module when you have not configured any channel to be part of the scan list.

MC3120 can be connected with MC3065 (the DMM module, if MC3065 is currently inserted).

For the technical specifications of this module, please refer to the User's Guide or Data Sheet of this product.

MC3120 is as shown in the figure below.

Figure 8 MC3120

M3TB20 is an external terminal block applicable to MC3120. Its appearance and detailed layout are as shown in the figure below. There are 20 pairs of connecting terminals from the lower-left corner to the upper-right corner corresponding to the 20 channels of MC3120 respectively. The connecting terminals can be recognized via the labels (CH01 to CH20) below or above them.

Figure 9 M3TB20

The figure below is the schematic diagram of MC3120 and M3TB20.

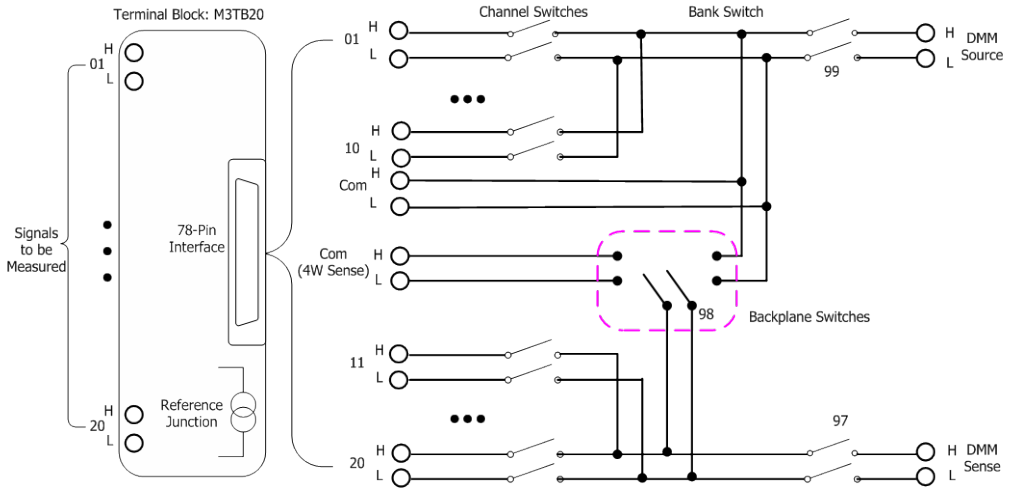
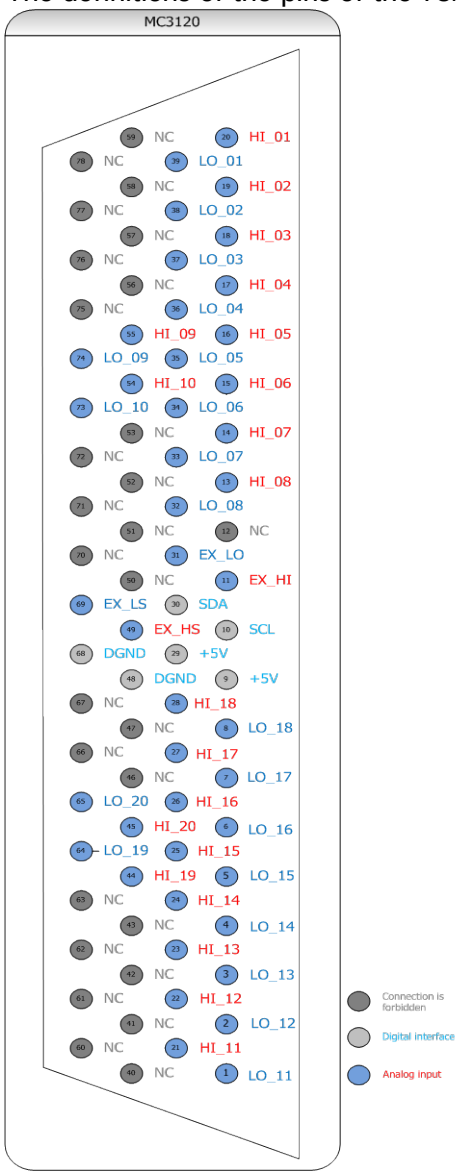


Figure 10 MC3120 Schematic Diagram

The definitions of the pins of the 78Pin interface of MC3120 are as shown in the figure below.



Pin Label	Pin Qty.	Definition
HI_n[1]	20	Correspond to the 20-channel differential positive input terminal on the external terminal block
LO_n[1]	20	Correspond to the 20-channel differential negative input terminal on the external terminal block
NC	28	Connection is forbidden
EX_HI	1	Correspond to the 2-W HI terminal on the external terminal block
EX_LO	1	Correspond to the 2-W LO terminal on the external terminal block
EX_HS	1	Correspond to the SENSE HI terminal on the external terminal block
EX_LS	1	Correspond to the SENSE LO terminal on the external terminal block
+5V	2	Connected to the digital temperature sensor (I^2C type) on the external terminal block
DGND	2	
SDA	1	
SCL	1	

Note[1]: n is an integer from 01 to 20.

2. MC3132 and M3TB32

MC3132 is a 32-channel multiplexer. All the 32 channels switch both HI and LO inputs, thus providing fully isolated signals for the DMM module. MC3132 is divided into two banks (called A and B) with 16 two-wire channels for each bank. When making 4-wire resistance measurement, the instrument automatically pairs the channels of A bank and B bank. All the channels added into the scan list are break-before-make. You can close multiple channels on this module when you have not configured any channel to be part of the scan list.

MC3132 can be connected with MC3065 (the DMM module, if MC3065 is currently inserted).

MC3132 is as shown in the figure below.

Figure 11 MC3132

M3TB32 is an external terminal block applicable to MC3132. Its appearance and detailed layout are as shown in the figure below. There are 32 pairs of connecting terminals from the lower-left corner to the upper-right corner corresponding to the 32 channels of MC3132 respectively. The connecting terminals can be recognized via the labels (CH01 to CH32) below or above them.

Figure 12 M3TB32

The figure below is the schematic diagram of MC3132 and M3TB32.

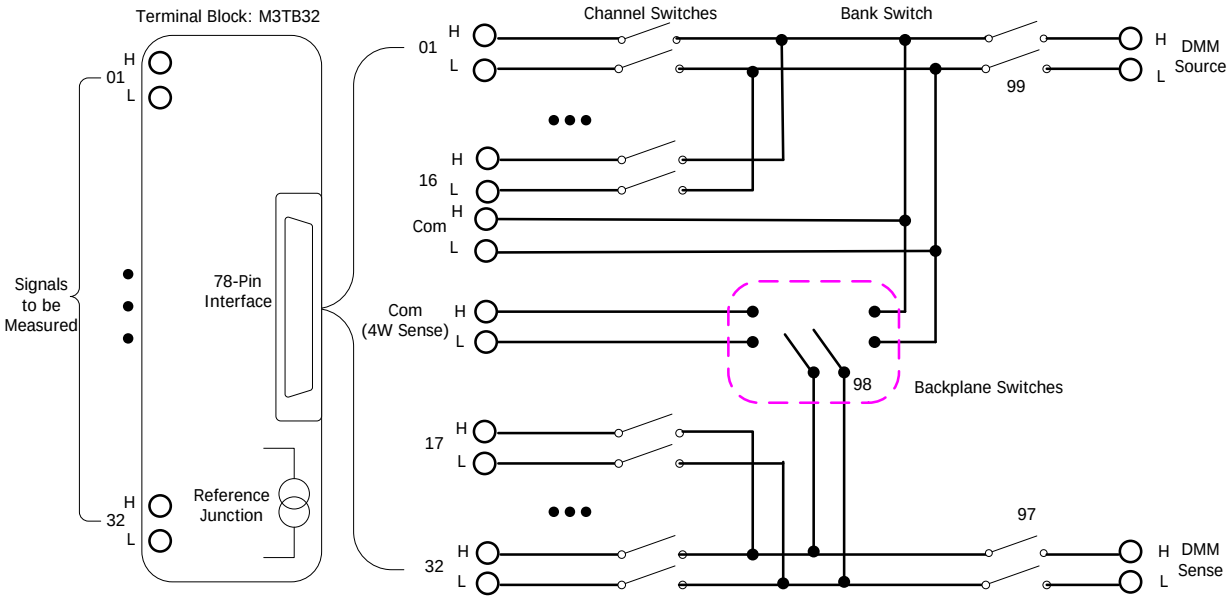
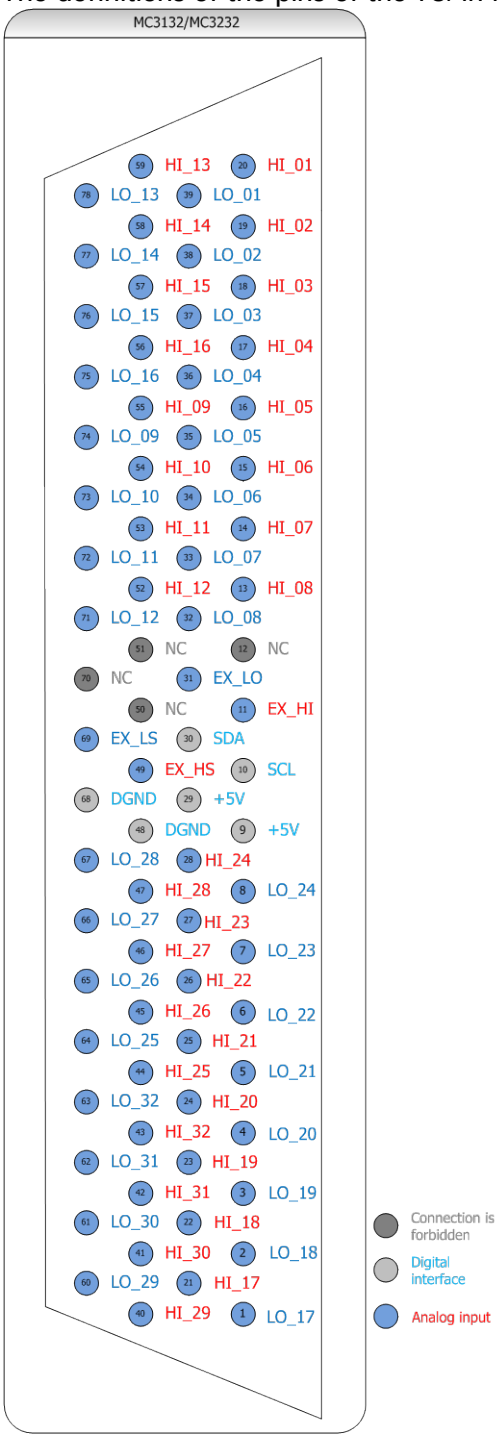


Figure 13 MC3132 Schematic Diagram

The definitions of the pins of the 78Pin interface of MC3132 are as shown in the figure below.



Pin Label	Pin Qty.	Definition
HI_n[1]	32	Correspond to the 32-channel differential positive input terminal on the external terminal block
LO_n[1]	32	Correspond to the 32-channel differential negative input terminal on the external terminal block
NC	4	Connection is forbidden
EX_HI	1	Correspond to the 2-W HI terminal on the external terminal block
EX_LO	1	Correspond to the 2-W LO terminal on the external terminal block
EX_HS	1	Correspond to the SENSE HI terminal on the external terminal block
EX_LS	1	Correspond to the SENSE LO terminal on the external terminal block
+5V	2	Connected to the digital temperature sensor (I^2C type) on the external terminal block
DGND	2	
SDA	1	
SCL	1	

Note[1]: n is an integer from 01 to 32.

3. MC3164 and M3TB64

MC3164 is a 64-channel single-ended multiplexer. All the 64 channels can switch the HI input only. MC3164 is divided into two banks (A and B) with 32 single-ended channels for each bank. All the channels added into the scan list are break-before-make. In any case, you cannot close multiple channels on this module.

MC3164 can be connected with MC3065 (the DMM module, if MC3065 is currently inserted). MC3164 cannot be used for 4-wire resistance measurement.

MC3164 is as shown in the figure below.

Figure 14 MC3164

M3TB64 is an external terminal block applicable to MC3164. Its appearance and detailed layout are as shown in the figure below. The 64 connecting terminals correspond to the 64 channels of MC3164 respectively. The connecting terminals can be recognized via the labels (01 to 64) below or above them. This terminal block does not support 4-wire connection.

Figure 15 M3TB64

The figure below is the schematic diagram of MC3164 and M3TB64.

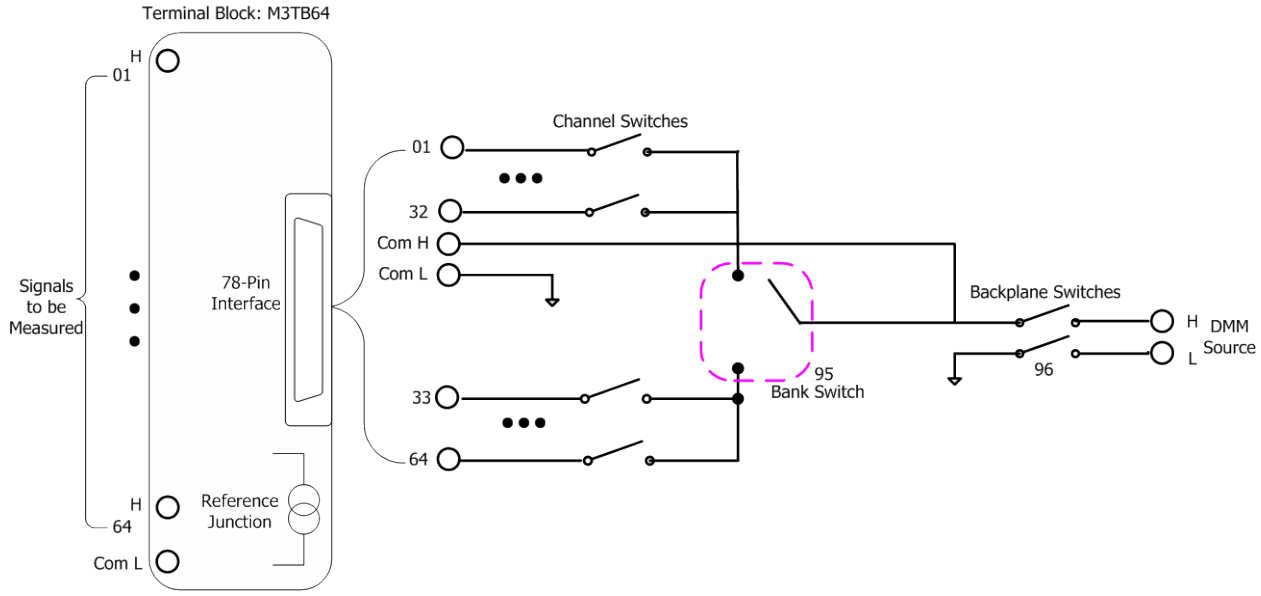
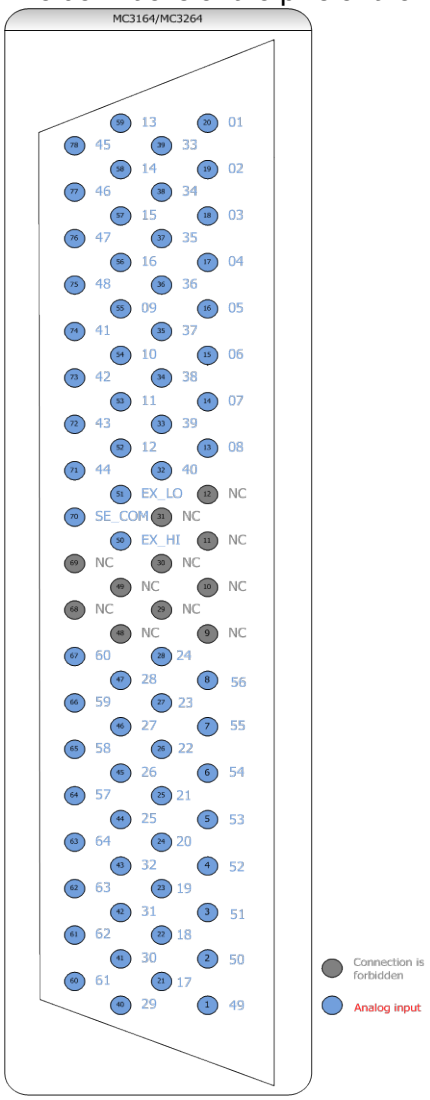


Figure 16 MC3164 Schematic Diagram

The definitions of the pins of the 78Pin interface of MC3164 are as shown in the figure below.



Pin Label	Pin Qty.	Definition
n[1]	64	Correspond to the 64-channel input terminal on the external terminal block
SE_COM	1	Correspond to the COM terminal on the external terminal block
NC	11	Connection is forbidden
EX_HI	1	Correspond to the HI terminal on the external terminal block
EX_LO	1	Correspond to the LO terminal on the external terminal block

Note[1]: n is an integer from 01 to 64.

4. MC3324 and M3TB24

MC3324 is a 20-voltage-channel + 4-current-channel mixed multiplexer. All the 20 voltage channels switch both HI and LO inputs, thus providing fully isolated inputs for the DMM module and the 20 voltage channels are divided into two banks (called A and B) with 10 two-wire channels for each bank. When making 4-wire resistance measurement, the instrument automatically pairs the channels of A bank and B bank. All the channels added into the scan list are break-before-make. You can close multiple channels on this module when you have not configured any channel to be part of the scan list. The 4 current channels are used in combination with the DMM module to perform the DCI or ACI measurement function. All the channels added into the scan list are break-before-make. In any case, you cannot close multiple channels on this module.

MC3324 can be connected with MC3065 (the DMM module, if MC3065 is currently inserted).

MC3324 is as shown in the figure below.

Figure 17 MC3324

M3TB24 is an external terminal block applicable to MC3324. Its appearance and detailed layout are as shown in the figure below. The 24 pairs of connecting terminals correspond to the 24 channels of MC3324 respectively. The connecting terminals can be recognized via the labels (CH01 to CH24) below or above them. Wherein, CH01 to CH20 are voltage channels and CH21 to CH24 are current channels.

Figure 18 M3TB24

The figure below is the schematic diagram of MC3324 and M3TB24.

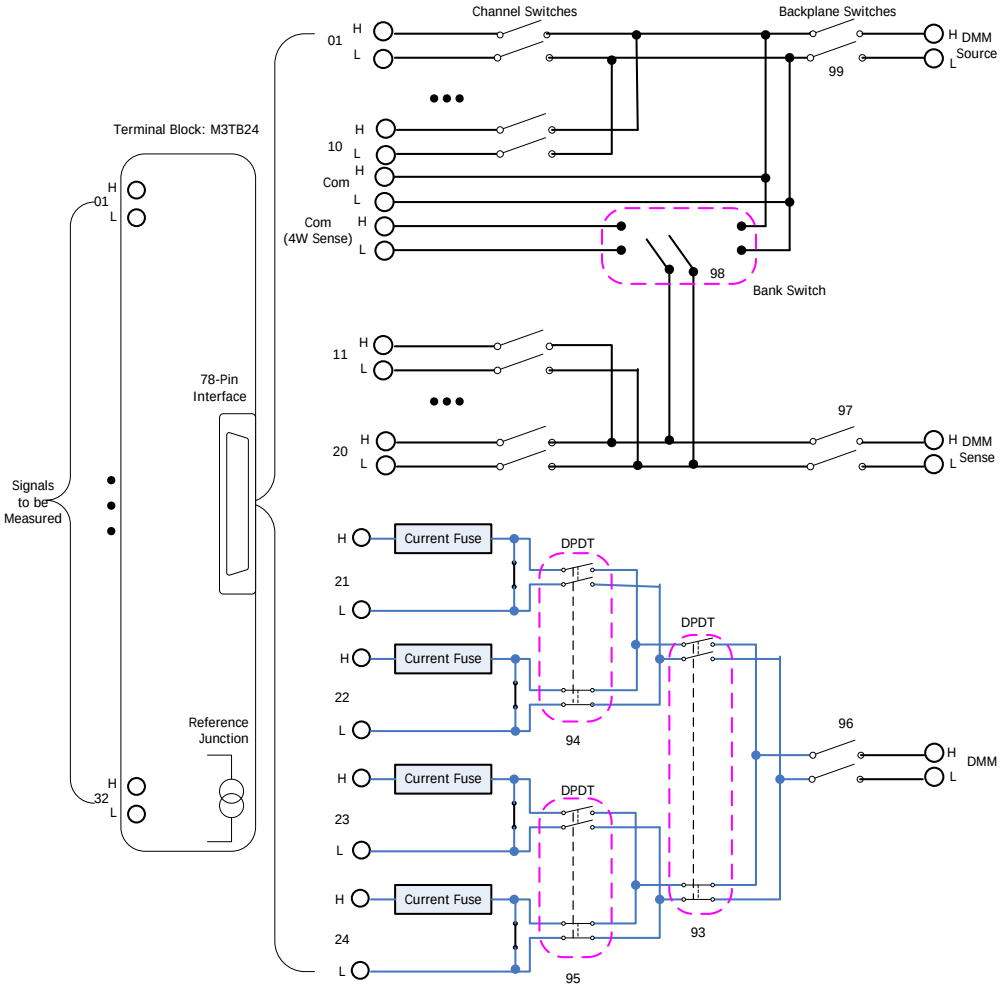
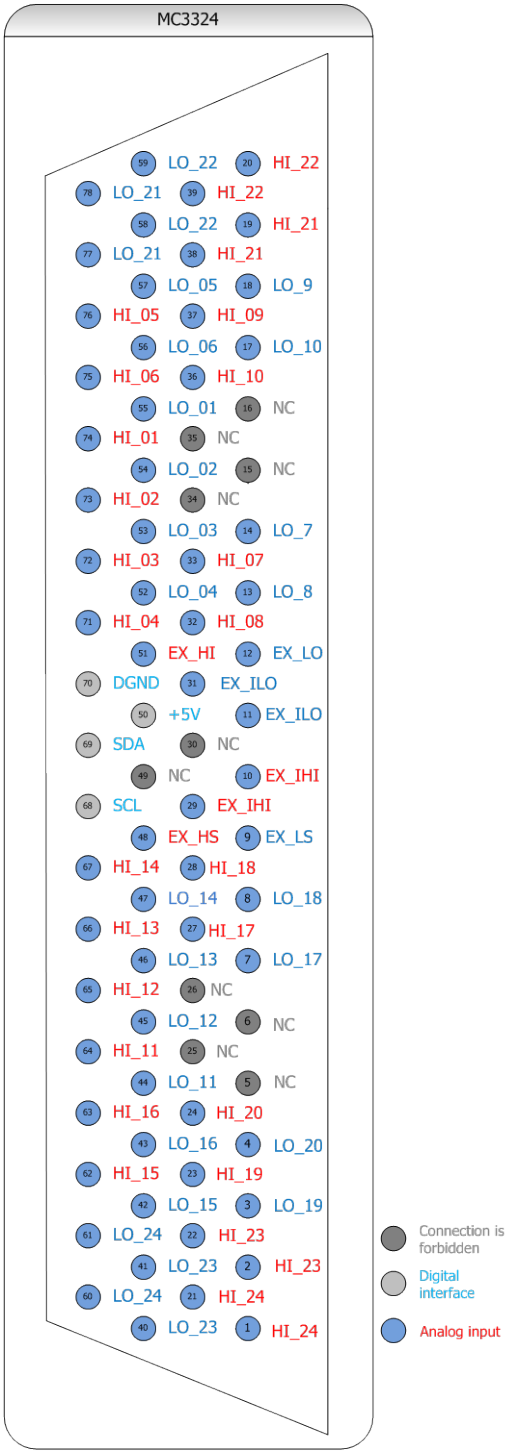


Figure 19 MC3324 Schematic Diagram

The definitions of the pins of the 78Pin interface of MC3324 are as shown in the figure below.



Pin Label	Pin Qty.	Definition
HI_n[1]	28	Correspond to the 24-channel differential positive input terminal on the external terminal block
LO_n[1]	28	Correspond to the 24-channel differential negative input terminal on the external terminal block
NC	10	Connection is forbidden
EX_HI	1	Correspond to the SOURCE HI terminal on the external terminal block
EX_LO	1	Correspond to the SOURCE LO terminal on the external terminal block
EX_HS	1	Correspond to the SENSE HI terminal on the external terminal block
EX_LS	1	Correspond to the SENSE LO terminal on the external terminal block
EX_ILO	1	Correspond to the CURR LO terminal on the external terminal block
EX_IHI	1	Correspond to the CURR HI terminal on the external terminal block
+5V	2	Connected to the digital temperature sensor (I^2C type) on the external terminal block
DGND	2	
SDA	1	
SCL	1	

Note[1]: n is an integer from 01 to 24.

To Connect the Signal under Test

For different multiplexer and external terminal block, the connection mode of the signal under test is different.

1. 1-wire Mode

MC3164 provides 64 single-ended channels and a commom LO terminal. The signal under test is connected in 1-wire mode, as shown in the figure below.

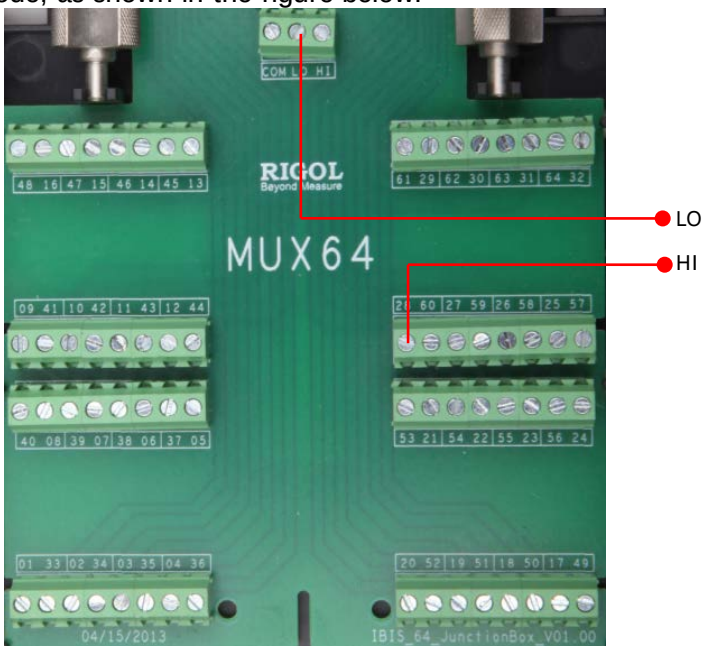


Figure 20 1-wire Connection Mode

2. 2-wire Mode

When MC3120, MC3132 or MC3324 is used, the signal under test can be connected in 2-wire mode, as shown in the figure below.

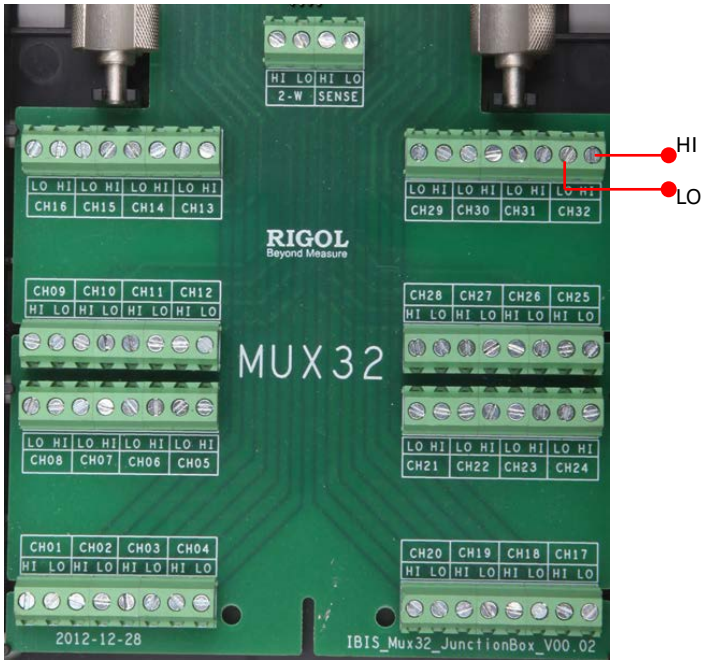


Figure 21 2-wire Connection Mode

3. 4-wire Mode

When MC3120, MC3132 or MC3324 (the first 20 channels) is used, the signal under test can be connected in 4-wire mode, as shown in the figure below.

When 4-wire mode is used for connection, for MC3120 and MC3324 (the first 20 channels), the instrument pairs channel n with channel n+10 (wherein, n is an integer between 1 and 10); for MC3132, the instrument pairs channel m with channel m+16 (wherein, m is an integer between 1 and 16).

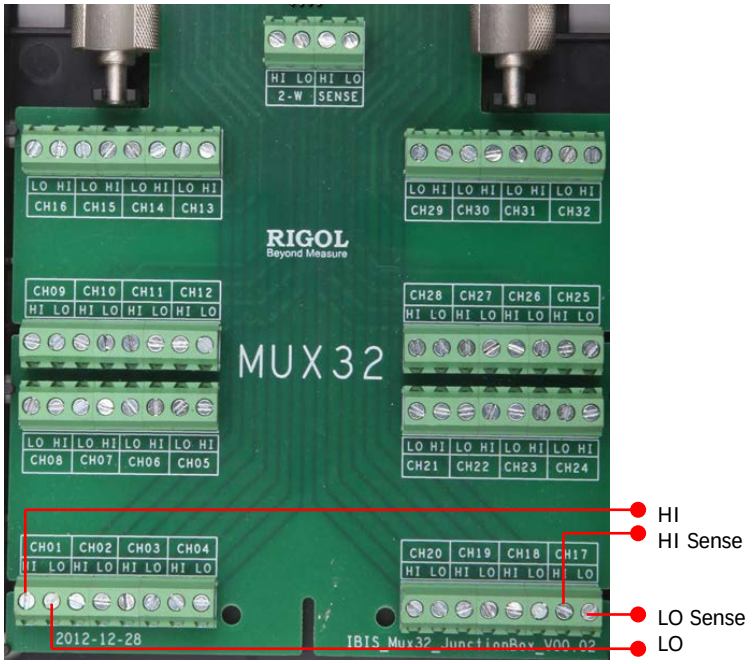
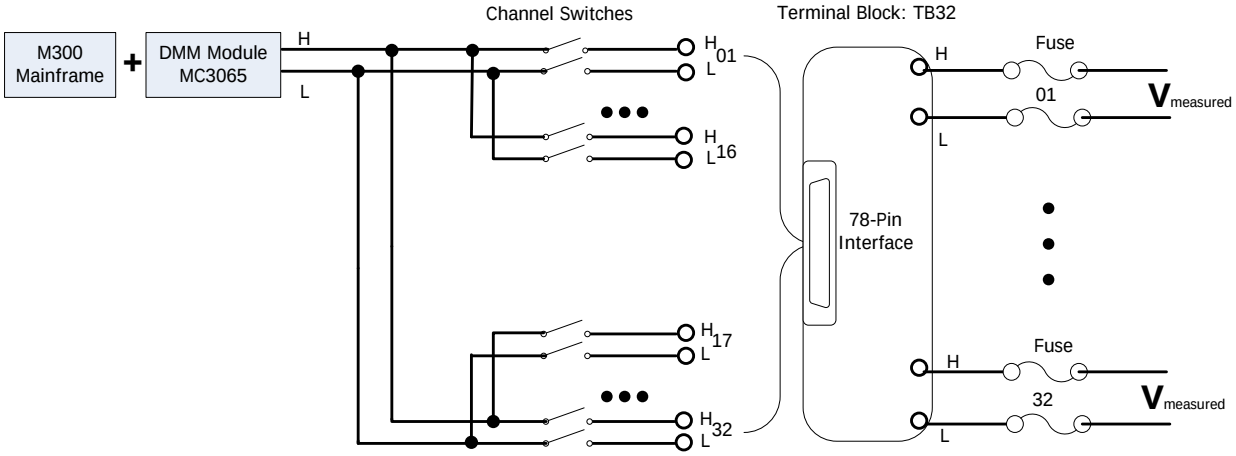


Figure 22 4-wire Connection Mode

Measurement Notices

- When using the mutliplexer module for measurement, make sure that both the amplitude of the signal under test and the commom mode voltage are no greater than the maximum input voltage of the module.
- When the multiplexer module is used to measure an object with high-power output ability (such as battery and power supply), to avoid damaging the relay, you are recommended to connect a fuse in series when making connections (as shown in the figure below).



Actuator and Terminal Block

MC3416 is a 16-channel actuator. It can connect signals to the device under test or enable external devices. Any of the 16 channels can switch to Normally-Open (NO) and Normally-Closed (NC) states. MC3416 is as shown in the figure below.

Figure 23 MC3416

M3TB16 is an external terminal block applicable to MC3416. Its appearance and detailed layout are as shown in the figure below. The 16 groups of connecting terminals correspond to the 16 channels of MC3416 respectively. The connecting terminals can be recognized via the labels (CH01 to CH16) below or above them. For each group of connecting terminals, NO denotes Normally-Open, NC denotes Normally-Closed and COM denotes the connom terminal.

Figure 24 M3TB16

The figure below is the schematic diagram of MC3416 and M3TB16.

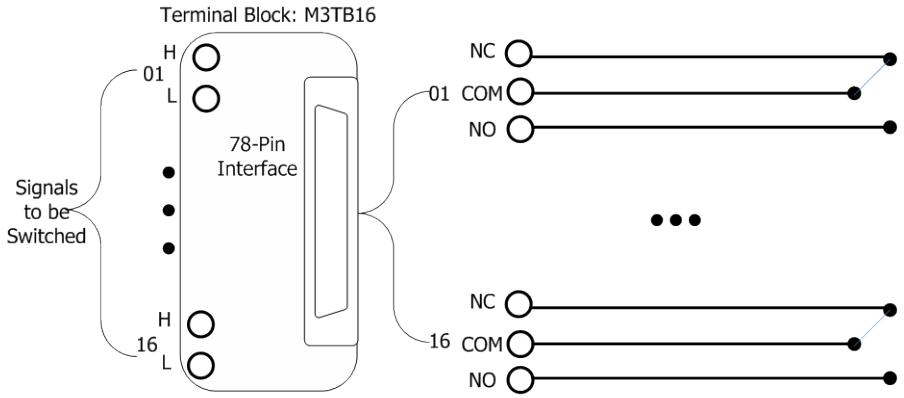
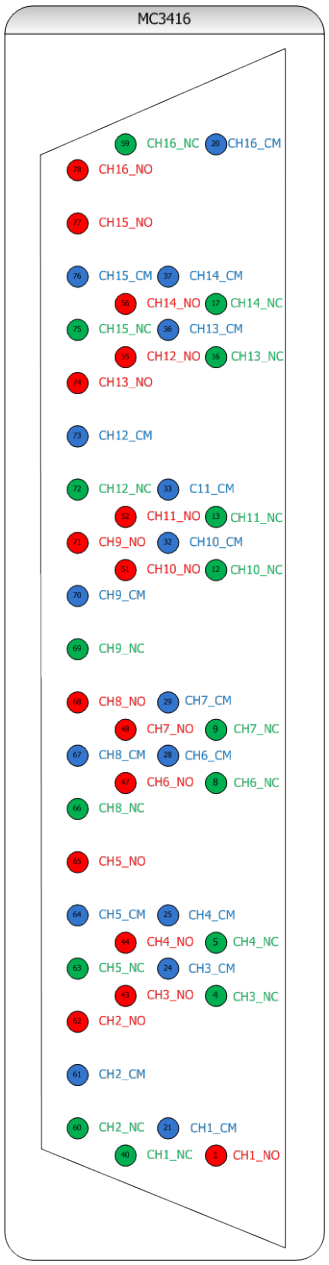


Figure 25 MC3416 Schematic Diagram

The definitions of the pins of the 78Pin interface of MC3416 are as shown in the figure below.



Pin Label	Pin Qty.	Definition
CHn_NC[1]	16	Correspond to the 16-channel NC terminal[2] on the external terminal block
CHn_NO[1]	16	Correspond to the 16-channel NO terminal[3] on the external terminal block
CHn_CM[1]	16	Correspond to the 16-channel COM terminal[4] on the external terminal block
Not included in the figure	30	Not used

Note[1]: n is an integer from 01 to 16.
Note[2]: NC refers to Normally Closed.
Note[3]: NO refers to Normally Open.
Note[4]: COM refers to Common.

Multifunction Module and Terminal Block

The multifunction module (MC3534) provides 3 kinds of functions with 4 channels for each function. This module can be used to check status or control external devices (such as solenoids, power relays and microwave switches). You can also read the digital inputs and the totalizer count during a scan.

- DIO: four 8-bit digital input/output (DIO) ports
- TOT: 4 totalizer (TOT) input terminals (the first two channels are 10 MHz TOT and the other two channels are 100 kHz TOT) with 1 Vpp sensitivity
- DAC: 4 analog output terminals and can output ±12 V calibrated voltage

MC3534 is as shown in the figure below.

Figure 26 MC3534

M3TB34 is an external terminal block applicable to MC3534. Its appearance and detailed layout are as shown in the figure below. The connecting terminals correspond to the 12 channels of MC3534 respectively. The connecting terminals can be recognized via the labels (PORT1 to PORT4, TOT1 to TOT4 and DAC1 to DAC4) below or above them.

Figure 27 M3TB34

The figure below is the schematic diagram of MC3534 and M3TB34.

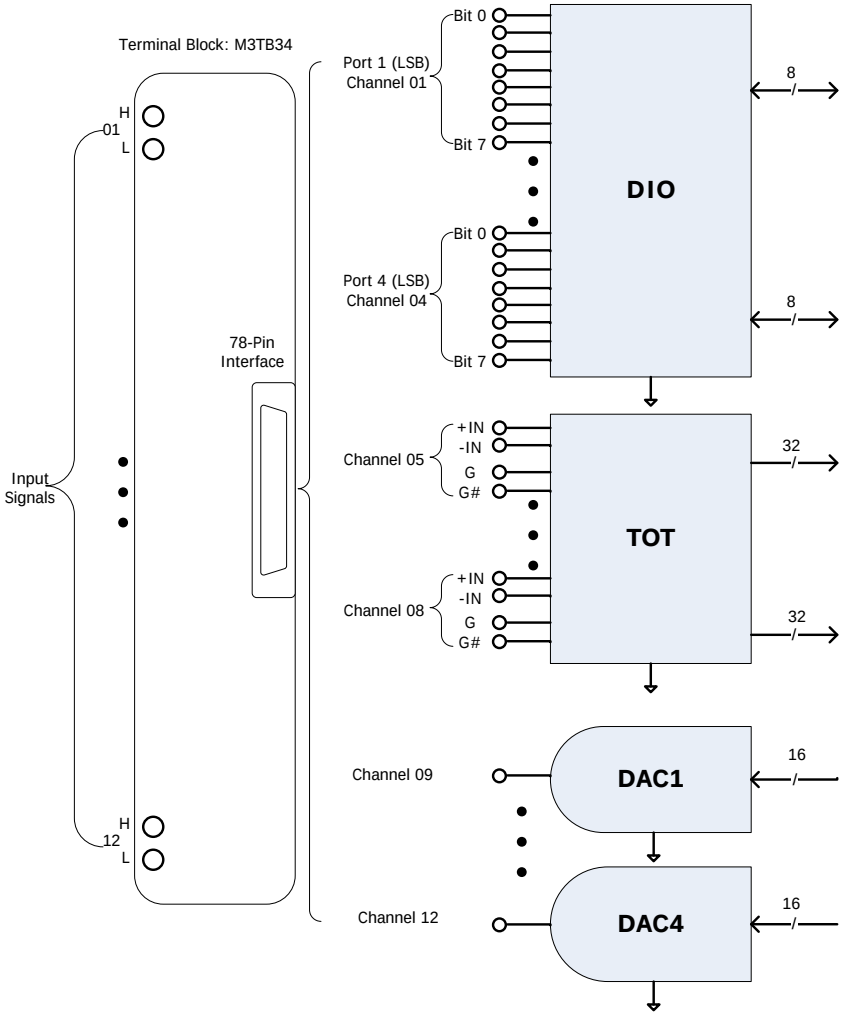
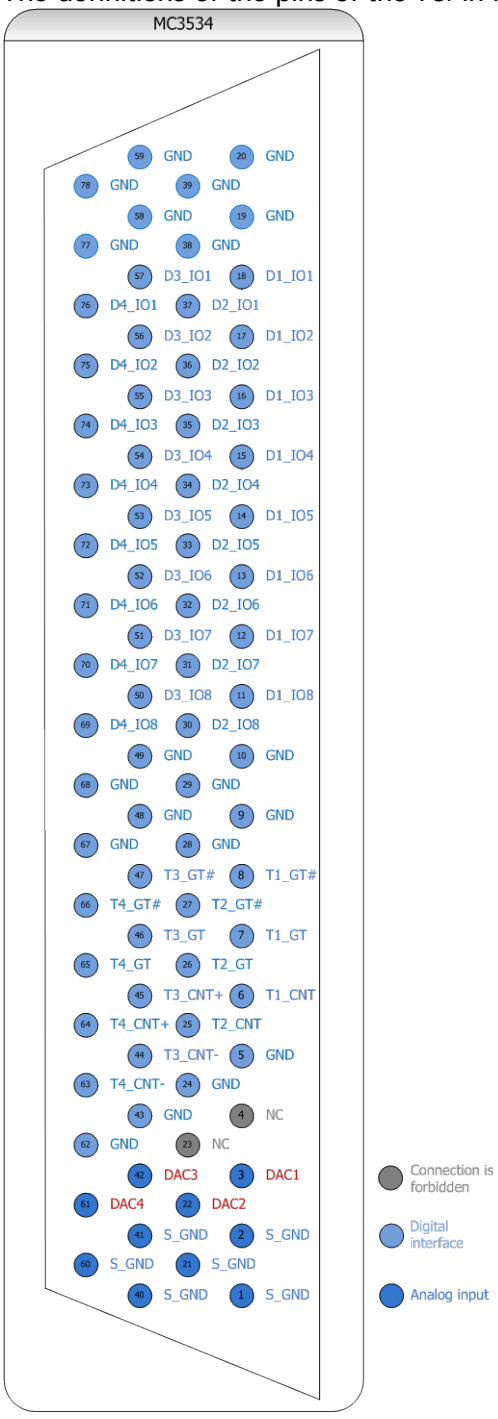


Figure 28 MC3534 Schematic Diagram

The definitions of the pins of the 78Pin interface of MC3534 are as shown in the figure below.



Pin Label	Pin Qty.	Definition
Dn_In[1]	24	Correspond to the digital input/output terminal on the external terminal block
Tm_GT#[2]	4	Correspond to the TOT channel input terminal on the external terminal block
Tm_GT[2]	4	
T3_CNT+ T4_CNT+	2	
T3_CNT- T4_CNT-	2	
DACm[2]	4	Correspond to the DAC channel output terminal on the external terminal block
NC	2	Connection is forbidden
GND	20	Ground terminal
S_GND	6	Correspond to the GND terminal of the DAC channel on the external terminal block

Note[1]: n is an integer from 01 to 08.
Note[2]: m is an integer from 1 to 4.

Matrix Switch and Terminal Block

MC3648 is a 4×8 two-wire matrix switch. The 32 two-wire crossing points can connect any combination of inputs and outputs at the same time. MC3648 is used to connect multiple devices to multiple points on the device under test at the same time when making tests. You can connect the rows and columns of multiple matrix switches to form a relatively larger matrix (such as 8×8 and 4×16, the number of crossing points cannot exceed 160). MC3648 is as shown in the figure below.

Figure 29 MC3648

M3TB48 is an external terminal block applicable to MC3648. Its appearance and detailed layout are as shown in the figure below. The connecting terminals correspond to the rows and columns of MC3648 respectively. The connecting terminals can be recognized via the labels (ROW1 to ROW4 and COL1 to COL8) below them or at the left/right of them.

Figure 30 M3TB48

The figure below is the schematic diagram of MC3648 and M3TB48.

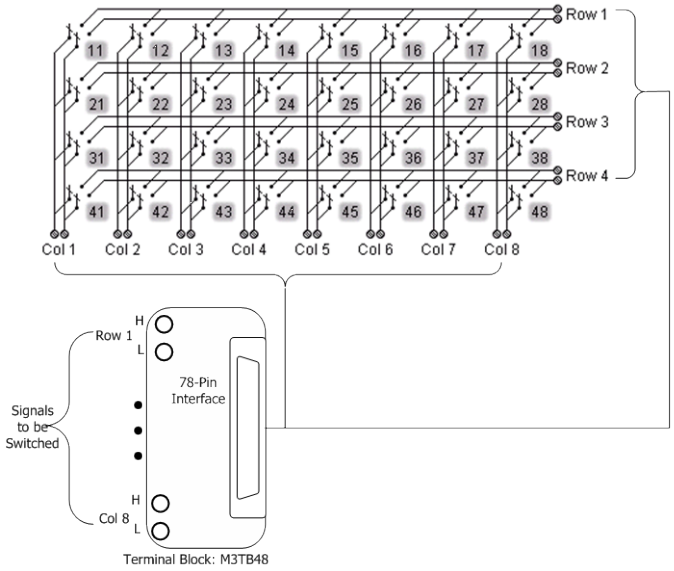
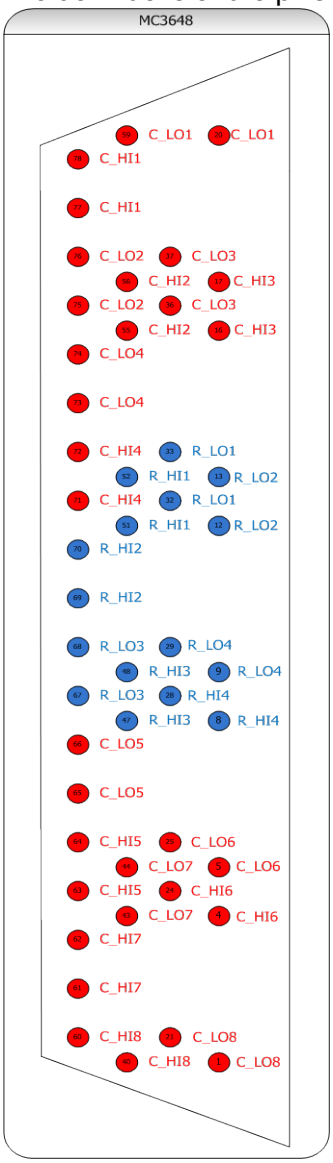


Figure 31 MC3648 Schematic Diagram

The definitions of the pins of the 78Pin interface of MC3648 are as shown in the figure below.



Pin Label	Pin Qty.	Definition
C_LOn[1]	16	Correspond to the signal input terminal on the external terminal block
C_HIn[1]	16	
R_LOm[2]	8	
R_HIm[2]	8	
Not included in the figure	30	Not used

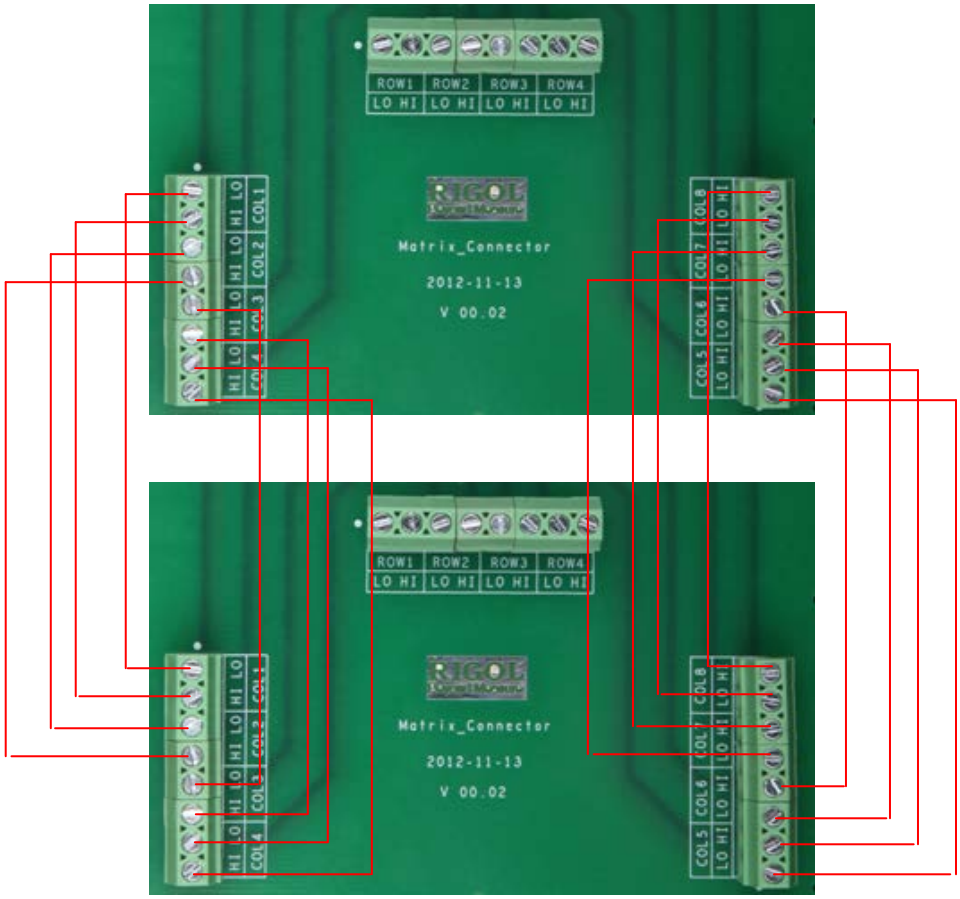
Note[1]: C refers to Column. n is an integer from 1 to 8.
Note[2]: R refers to Row. m is an integer from 1 to 4.

To Connect Multiple Matrix Switches

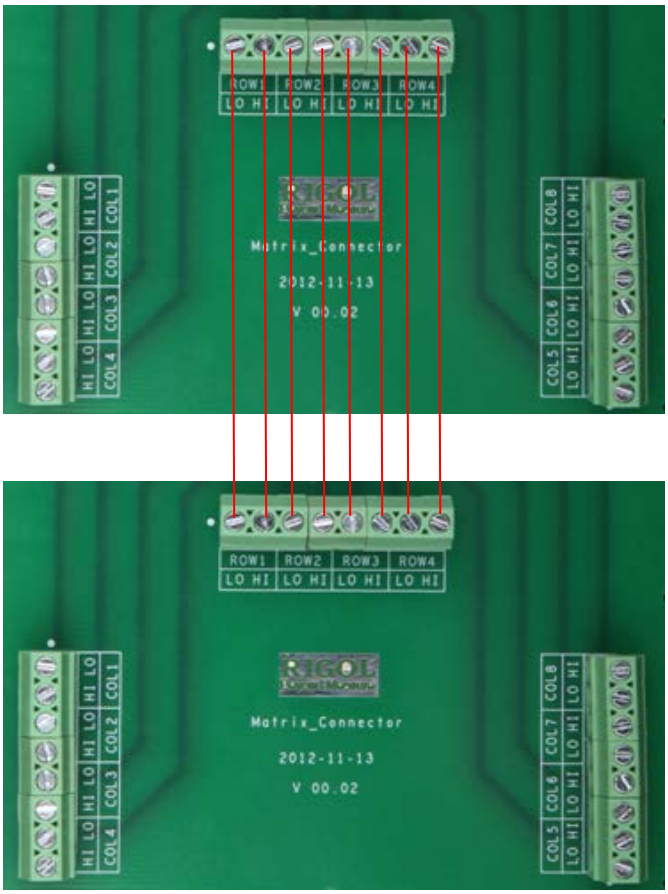
You can connect the rows and columns of multiple matrix switches to form a relatively larger matrix (such as 8×8 and 4×16; the number of crossing points cannot exceed 160, namely connecting 5 MC3648 modules).

This section introduces the operation methods by introducing how to connect two MC3648 modules. Connect the corresponding connecting terminals of the columns or rows of the two external terminal blocks using connecting cables according to the measurement needs.

- Connect the columns of the two M3TB48 modules to increase the number of rows and form an 8×8 matrix.



- Connect the rows of the two M3TB48 modules to increase the number of columns and form a 4×16 matrix.



Notices

- When using the matrix switch, you can close multiple channels and connect multiple inputs to multiple outputs at the same time. Before making any connection, make sure that the connection will not cause any danger.
- The combined matrix provides more complicated signal switch. You can connect more inputs to more outputs at the same time. Please make sure that the connection will not cause any danger.

Other Optional Accessories

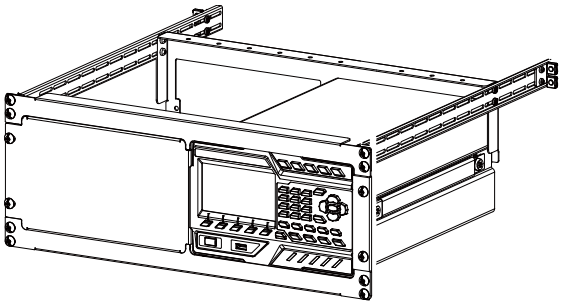
For the detailed information of Ultra Acquire and the rack mount kit, refer to the corresponding manuals (download the manuals from **RIGOL** website (www.rigol.com)). This chapter provides brief introductions of the RS232 serial cable, GPIB invert port and analog bus external port.

RS232 Serial Cable

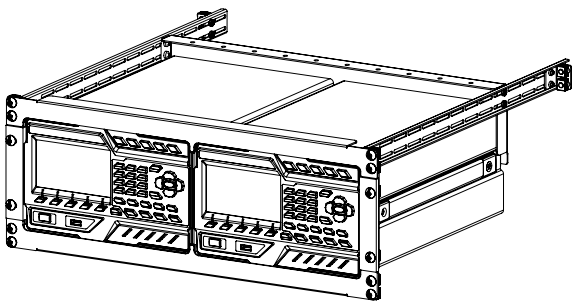
GPIB Invert Port

Analog Bus External Port

Ultra Acquire



Rack Mount Kit (One Instrument)



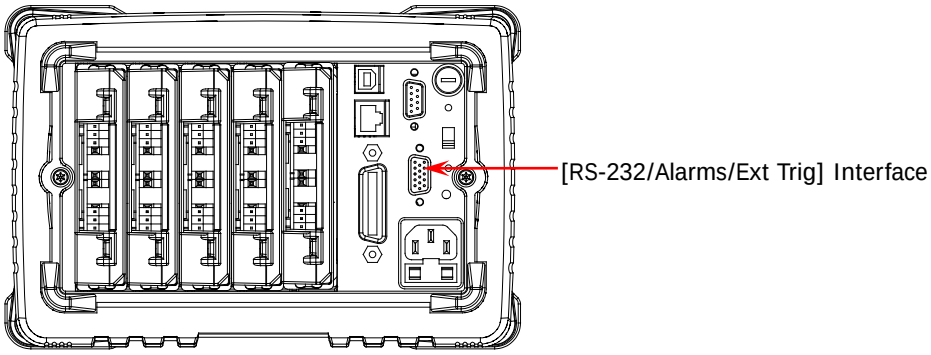
Rack Mount Kit (Two Instruments)

RS232 Serial Cable

The RS232 serial cable is used to connect the RS232 interface of M300 with the PC or data terminal equipment (DTE) for serial communication.

The connecting procedures are as follows.

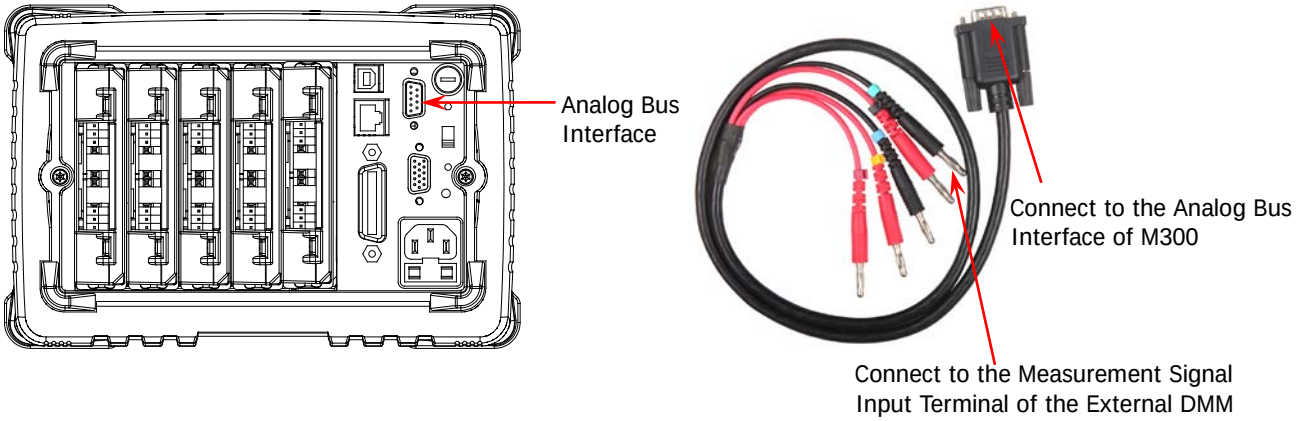
1. Convert the **[RS-232/Alarms/Ext Trig]** interface at the rear panel to two 9-pin interfaces using the mixed-interface separator line (standard accessory). Wherein, one interface is a 9-pin male interface used as a standard RS232 interface and the other is a 9-pin female interface used for alarm output and external trigger signal input.



2. Connect the RS232 interface with the PC or data terminal equipment (DTE) using a RS232 serial cable. Set the interface parameters (such as the baud rate and check bit) to match the PC or data terminal equipment. At this point, you can control the instrument remotely. The measurement results of the instrument can be output to a serial receiving device via this interface.

Analog Bus External Port

The analog bus external port is used to connect the analog bus interface at the rear panel of M300 to the measurement signal input terminal at the front panel of the external digital multimeter.



Note: When connecting the external DMM, the 5 terminals of the analog bus external port should be connected to the measurement signal input terminals of the external DMM according to the corresponding relations (as shown in the table below) between the numbers of the colored rings on the analog bus external port terminals and the measurement signal input terminals of the external DMM.

No.	Corresponding Input Terminal
6	HI
2	LO
7	HI SENSE
3	LO SENSE
1	CURRENT

To Select Optional Accessories

1. If you want to make measurements

Step 1: Select the DMM module or use external DMM

- The DMM module (MC3065) is recommended
  With MC3065, you can perform DCV, ACV, DCI, ACI, 2WR (2-wire resistance), 4WR (4-wire resistance), FREQ, PERIOD, TEMP (temperature) and SENSOR (any sensor) measurements.
- Alternate plan
  If you already has a digital multimeter (such as **RIGOL** DM3068), you can order an analog bus external port which together with the digital multimeter and the mixed-interface separator line (standard accessory) can be used in place of MC3065.

Step 2: Select the desired modules according to your measurement needs

Get a basic understanding of the specifications and supported measurement functions of each module by referring to the *M300 Data Sheet* and *M300 User's Guide* and order the desired modules according to your measurement needs.

Step 3: Select the terminal blocks corresponding to the modules selected

Module	Terminal Block
MC3120	M3TB20
MC3132	M3TB32
MC3164	M3TB64
MC3324	M3TB24

2. If you do not need to make measurements

- If only single input/output switch is required, please select MC3416 and M3TB16.
- If multiple input/output switches are required, please select MC3648 and M3TB48.
- If the digital input/output (DIO), totalizer (TOT) or analog voltage output (DAC) function is required, please select MC3534 and M3TB34.

3. Select other optional accessories

- If the RS232 interface of M300 is required for communication, please order the RS232 serial cable and use it with the mixed-interface separator line (standard accessory).
- If you want to change the direction of the GPIB interface, please order the GPIB invert port.
- If you want to install M300 into a standard 19-inch machine cabinet, please order the rack mount kit for a single instrument or the rack mount kit for two instruments according to your need.
- If you want to use the advanced functions of Ultra Acquire (all history data preview, re-calculation and report generator), please order Ultra Acquire. If you only want to use the basic functions of Ultra Acquire, you can download the installation file from http://www.rigol.com/prodserv/M300/software/ (you do not need to order the software).

Appendix: Temperature Sensor Selection Reference

Temperature measurement is one of the main functions of M300. The temperature sensors used in the temperature measurements are not the standard accessories or optional accessories of M300 and you need to buy the temperature sensor according to the actual measurement need. This section lists the recommended temperature sensor models for your reference.

1. Recommended Thermocouples

Recommended Model	Type	Temperature Range	Tolerance[1]	Explanation
OMEGA 5TC-GG-J-20-72 OMEGA 5TC-GG-J-24-72 OMEGA 5TC-GG-J-30-72 OMEGA 5TC-TT-J-36-72	J	-40℃ to +375℃	±0.5℃	Can provide NIST calibration
		375℃ to 750℃	±0.004|t|	
OMEGA 5TC-GG-K-20-72 OMEGA 5TC-GG-K-24-72 OMEGA 5TC-GG-K-30-72 OMEGA 5TC-TT-K-36-72	K	-40℃ to +375℃	±1.5℃	
		375℃ to 1000℃	±0.004|t|	
OMEGA 5TC-GG-T-20-72 OMEGA 5TC-GG-T-24-72 OMEGA 5TC-GG-T-30-72 OMEGA 5TC-TT-T-36-72	T	-40℃ to +125℃	±1.5℃	
		125℃ to 350℃	±0.004|t|	
OMEGA 5TC-GG-E-20-72 OMEGA 5TC-GG-E-24-72 OMEGA 5TC-GG-E-30-72 OMEGA 5TC-TT-E-36-72	E	-40℃ to +375℃	±1.5℃	
		375℃ to 800℃	±0.004|t|	

Note[1]: The specifications listed are the specifications of the thermocouples rather than those of M300.

2. Recommended RTDs

Recommended Model	Temperature Range	Temperature Precision	Explanation
OMEGA PR-10-2-100-1/8-6-E OMEGA PR-10-2-100-1/8-12-E OMEGA PR-10-2-100-1/8-18-E OMEGA PR-10-2-100-1/8-24-E OMEGA PR-10-2-100-1/4-6-E OMEGA PR-10-2-100-1/4-12-E OMEGA PR-10-2-100-1/4-18-E OMEGA PR-10-2-100-1/4-24-E	-50℃ to 250℃	Conform to IEC CLASS B ±0.30℃@0℃	High-precision film type 100Ω or 100Ω B class DIN Platinum element Conform to IEC751 standard α=0.00385Ω/Ω/℃
OMEGA PR-20-2-100-1/8-2-E-T OMEGA PR-20-2-100-3/16-2-E-T OMEGA PR-20-2-100-1/4-2-E-T	-50℃ to 260℃	Conform to IEC CLASS A ±0.15℃@ 0℃	High-precision 100Ω A class DIN Platinum element Conform to IEC751 standard α=0.00385Ω/Ω/℃
OMEGA PR-20-2-100-1/8-2-E-G OMEGA PR-20-2-100-3/16-2-E-G OMEGA PR-20-2-100-1/4-2-E-G	-50℃ to 450℃		

3. Recommended Thermistors

Recommended Model	Rated Resistance (under 25℃)	Beta 0-50℃ (K)	Resistance Ratio 25/125℃	Interchangeable Error at 0-70℃	Max. Working Temperature
OMEGA 44004	2252Ω	3891	29.26	±0.2℃	150℃
OMEGA 44005	3000Ω	3891	29.26		
OMEGA 44007	5000Ω	3891	29.26		
OMEGA 44006	10kΩ	3574	23.51		
OMEGA 44008	30kΩ	3810	29.15		
OMEGA 44011	100kΩ	3988	34.82		

Typical temperature drifts for the above models.

Operation Temperature	10 Months	100 Months
0℃	<0.01℃	<0.01℃
25℃	<0.01℃	<0.02℃
100℃	0.20℃	0.32℃
150℃	1.5℃	Not recommended